Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.37058

Linking organic carbon chemistry to colloidal carbon and metal mobilization in riparian systems

SHARON E. BONE[1], QIUJUN TAN[2], BRANDY D. STEWART[3], VINCENT NOËL[3], ELEANOR SPIELMAN-SUN[3], KRISTIN BOYE[3], SAM PIERCE[4] AND MATTHEW A MARCUS[5]

[1]Forschungszentrum Juelich
[2]Bonn University
[3]SLAC National Accelerator Laboratory
[4]Stanford university
[5]Lawrence Berkeley National Laboratory

Colloidal mobilization is a well-known mechanism of organic matter and metal transport in groundwater and surface water. However, the relationship between organic matter composition – which impacts its ability to interact with minerals, complex metal ions, and serve as an electron donor for microbial respiration – and colloidal mobilization is not well understood.

We have observed that the both the concentration and functional group composition of colloidal organic matter varies in riparian porewaters as a function of redox conditions [1]. Notably, we found that elevated concentrations of carboxylate-rich, iron-associated colloidal organic matter were generated under anoxic conditions in riparian porewaters. We speculated that this carboxylate-rich organic material resulted from enhanced microbial activity and the production of microbial biomass and necromass.

We now seek to understand how both the concentration and composition of organic matter evolve over time in response to seasonal variability in redox conditions, and, moreover, what impact this has on the mobilization of metals (including iron and lead) between riparian soils and connected surface waters. To this end, we monitor soil, porewater, and stream water geochemistry (carbon, iron, and lead) over time. Through this work, we seek to understand whether there is a relationship between the composition of organic matter mobilized and the extent of carbon and metal mobilization. Further, we seek to clarify the feedback between redox conditions (notably iron reduction) and the mobilization and composition of organic matter.

1. Stewart, Bone, Spielman-Sun, Marcus, Pierce, Boye & Noël (2026), *Water Research* 295, 12555.